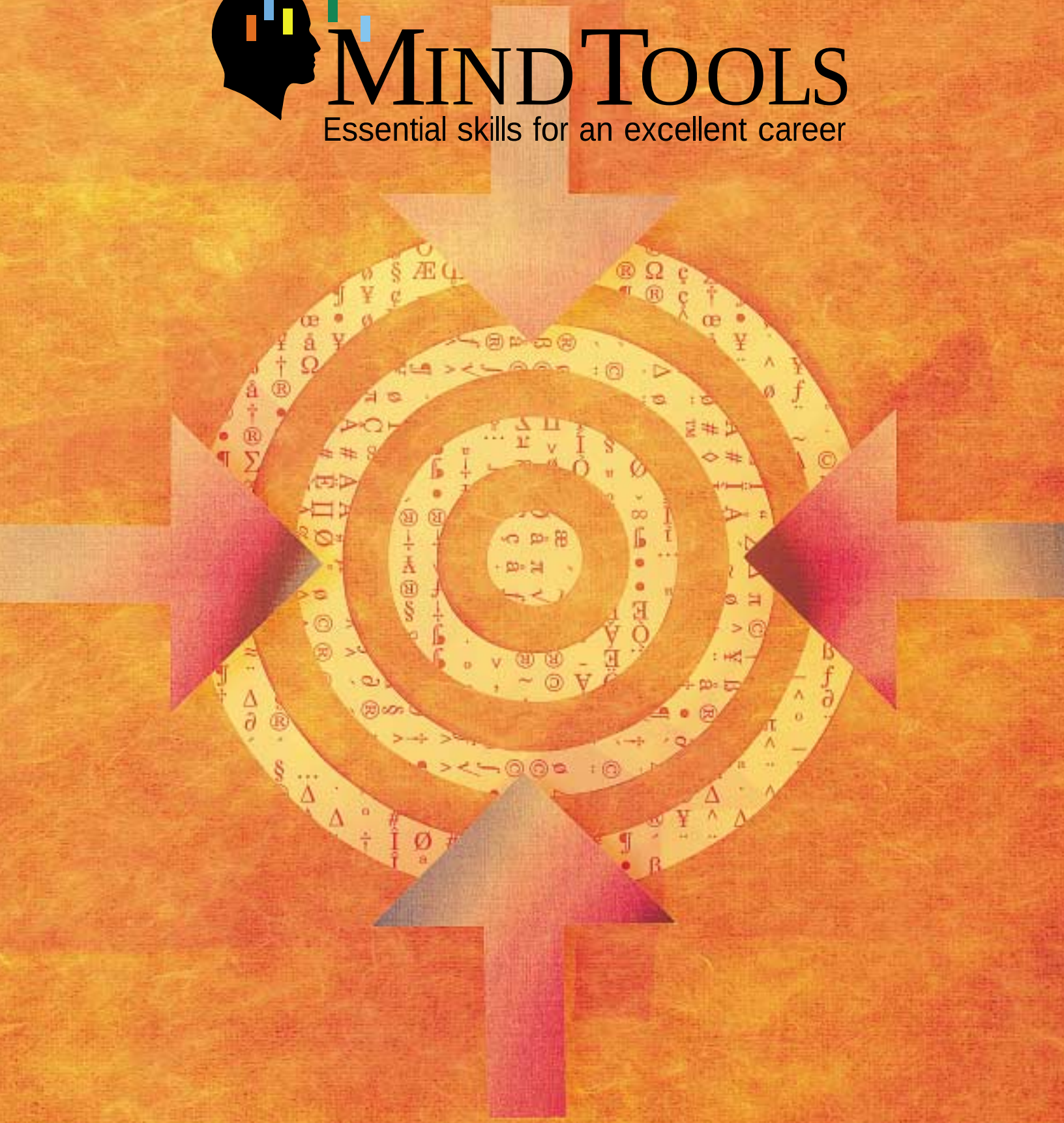
MindTools

Essential skills for an excellent career



Problem Solving Skills

Problem Solving Tools

Mind Tools - Practical Thinking Skills for an Excellent Life!

This e-book is published by:

Mind Tools Ltd
Hardwick House
Prospect Place
Swindon
SN3 1JE
United Kingdom

Version 2.00 – 6 May 2005

ISBN: 0-9545586-1-8 – Subsection 2

Tools for Mastering Complexity

- Extracting maximum information from facts - *Appreciation*
- Understanding problems in detail - *Drill-Down*
- Identifying possible causes of problems - *Cause & Effect Diagrams*
- Understanding the way factors affect one-another - *Systems Diagrams*
- Analyzing Strengths, Weaknesses, Opportunities and Threats - *SWOT Analysis*
- Making *Forecasts with Spreadsheets*
- Methods of *Risk Analysis*

2. Tools for Mastering Complexity

The tools in this section help you understand complicated, difficult situations. Without them problems might seem huge, overwhelming and excessively complex. By using these formal techniques you can ensure that you carry out the best analysis possible. You will have considered all factors involved and identified further information needed. These tools give you a starting point in problem solving where other people would just feel helpless and intimidated by the situation.

We will look at the following tools:

- Extracting maximum information from facts - *Appreciation*
- Understanding problems in detail - *Drill-Down*
- Identifying possible causes of problems - *Cause & Effect Diagrams*
- Understanding the way factors affect one-another - *Systems Diagrams*
- Analyzing Strengths, Weaknesses, Opportunities and Threats - *SWOT Analysis*
- Making *Forecasts with Spreadsheets*
- Methods of *Risk Analysis*

The first half of the module covers general approaches. Appreciation is a useful technique for extracting good information from dry facts. Drill Down helps you to break large, seemingly unmanageable problems down into achievable parts. It also helps you to see where you need more information. Cause & Effect Diagrams are very useful for making sure that you have considered all factors relating to a problem, while Systems Diagrams are hugely powerful tools for showing how factors interact in complex situations.

The second half of the module discusses specific tools for specific situations. SWOT Analysis helps you to work out a survival and success strategy in a competitive environment. Forecasting with Spreadsheets shows you how to make financial models of your organization or projects. You can use these to work out whether projects are viable and use them to forecast the effects of changes in underlying factors. Risk Analysis provides a formal framework for identifying the risks you face, and helps you to work out a strategy for controlling them.

Appreciation (2.1)

Function: Extracting maximum information from facts

How to use tool: Appreciation is a very simple but powerful technique for extracting the maximum amount of information from a simple fact.

Starting with a fact, ask the question: “So what?'” - i.e. what are the implications of that fact? Keep on asking that question until you have drawn all possible inferences.

Example: Appreciation is a technique used by military planners, so we will take a military example:

Fact: *It rained heavily last night*

- *So What?*
  The ground will be wet
- *So What?*
  It will turn into mud quickly
- *So What?*
  If many troops and vehicles pass over the same ground, movement will be progressively slower and more difficult as the ground gets muddier and more difficult.
- *So What?*
  Where possible, stick to paved roads. Otherwise expect movement to be much slower than normal.

While it would be possible to reach this conclusion without the use of a formal technique, appreciation provides a framework within which you can extract information quickly, effectively and reliably.

Key points: Asking “so what?” repeatedly helps you to extract all important information implied by a fact.

Drill Down (2.2)

Function: Breaking complex problems down into manageable parts

---

How to use tool: Drill Down is a useful technique for breaking complex problems down into progressively smaller parts.

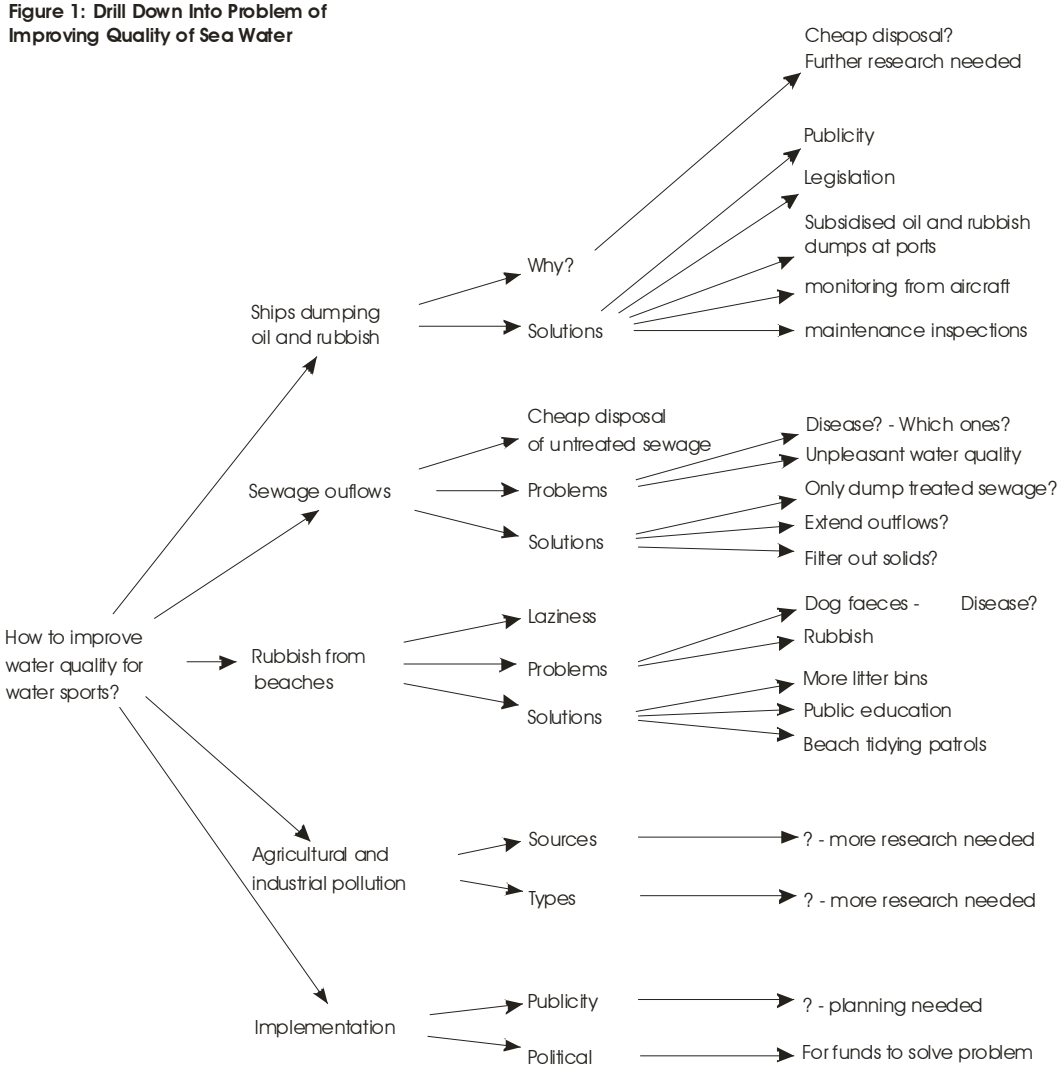
To use the technique, start by writing the problem down on the left-hand side of a large sheet of paper. Next, write down the points that make up the next level of detail on the problem a little to the right of this. These may be factors contributing to the problem, information relating to it, or questions raised by it. This process of breaking the problem down into its component part is called “Drilling Down”.

For each of these points, repeat the process. Keep on drilling down into points until you fully understand the factors contributing to the problem. If you cannot break them down using the knowledge you have, then carry out whatever research is necessary to understand the point.

Drilling into a question helps you to get a much deeper understanding of it. The process helps you to recognize and understand the factors that contribute to it. Drill Down prompts you to link in information that you had not initially associated with a problem. It also shows exactly where you need further information.

Example: The owner of a windsurfing club is having complaints from its members about the unpleasant quality of the water close to the clubhouse. This seems like a huge problem. She carries out the analysis below:

Figure 1: Drill Down Into Problem of Improving Quality of Sea Water



This gives her a starting point in which to begin thinking about solving the problem. It highlights where she does not fully understand the problem, and shows where she needs to carry out further research.

Key points: "Drill Down" helps you to break a large and complex problem down into its component parts, so that you can develop plans to deal with these parts. It also shows you which points you need to research in more detail.

Cause & Effect Diagrams (2.3)

Function: Identifying the likely causes of problems
Other Names: Fishbone diagrams, Ishikawa diagrams

Why use the tool? Cause & Effect Diagrams help you to think through causes of a problem thoroughly. Their major benefit is that they push you to consider all possible causes of the problem, rather than just the ones that are most obvious.

The approach combines Brainstorming with use of a type of Concept Map.

Cause & Effect Diagrams are also known as “Fish Bone Diagrams”. The boxes and lines that comprise them can be thought of as the head and spine of the fish.

How to use tool: Follow these steps to solve a problem with a Cause & Effect diagram:

1. Identify the problem:
Write down the exact problem you face in detail. Where appropriate identify who is involved, what the problem is, and when and where it occurs. Write the problem in a box on the left hand side of a large sheet of paper. Draw a line across the paper horizontally from the box. This gives you space to develop ideas.

2. Work out the major factors involved:
Next identify the factors that may contribute to the problem. Draw lines off the spine for each factor, and label it. These may be people involved with the problem, systems, equipment, materials, external forces, etc. Try to draw out as many possible factors as possible. If you are trying to solve the problem as part of a group, then this may be a good time for some brainstorming!

Using the 'Fish bone' analogy, the factors you find can be though of as the bones of the fish.

3. Identify possible causes:
For each of the factors you considered in stage ii, brainstorm possible causes of the problem that may be related to the factor. Show these as smaller lines coming off the 'bones' of the fish. Where a cause is large or complex, then it may be best to break the it down into sub-causes. Show these as lines coming off each cause line.

4. Analyse your diagram:
By this stage you should have a diagram showing all the possible causes of your problem. Depending on the complexity and importance of the problem, you can now investigate the most likely causes further. This may involve setting up investigations, carrying out surveys, etc. These will be designed to test whether your assessments are correct.

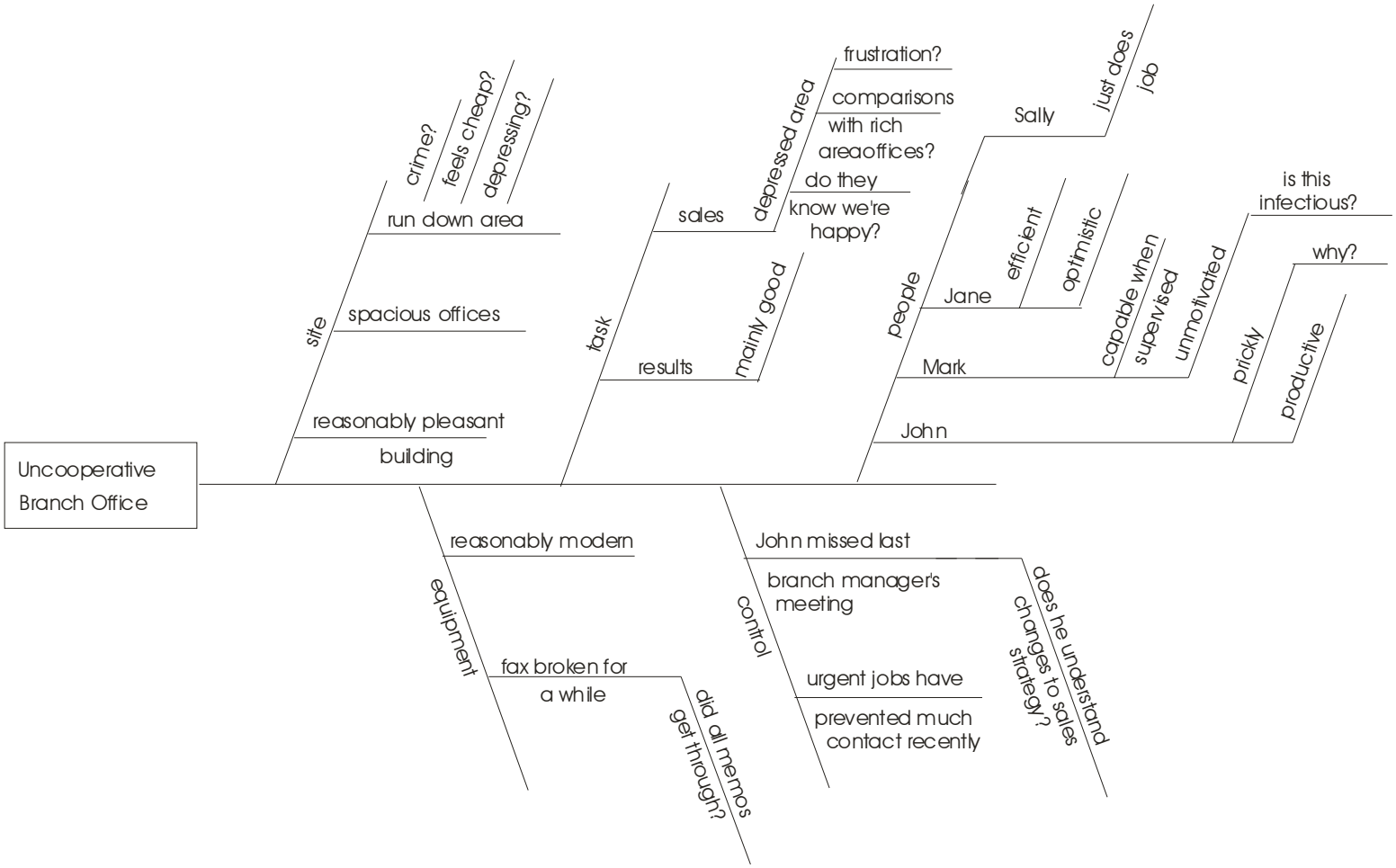
Cause & Effect Diagrams were devised by Kaoru Ishakawa in his book ‘What is Total Quality Control?’.

Example: The example below shows a Cause & Effect diagram drawn by a manager who is having trouble getting cooperation from a branch office.

If the manager had not thought the problem through (in this case using the Cause & Effect Diagram), he might have dealt with the problem by assuming that people were being difficult. Instead he might think that the best approach is to arrange a meeting with the Branch Manager. This would allow him to brief the manger fully, and talk through any problems that he may be facing.

Key points: Cause & Effect diagrams provide a structured way to help you think through all possible causes of a problem. This helps you to carry out a thorough analysis of a situation.

Figure 1: Cause & Effect Diagram Example:
A Manager's Analysis of Problems with a Branch Office



System Diagrams (2.4)

Function: Understanding the way factors affect one-another

Why use the tool? System diagrams are powerful tools that help you to understand how complex systems work. Systems analyzed may be anything from businesses, through biological population models, to the impact of social policy, etc.

System diagrams are particularly helpful in showing you how a change in one factor may impact elsewhere. They are excellent tools for flushing out the long-term impacts of a change. Importantly, a good system diagram will show how changing a factor may feed back to affect itself!

Drawing a system diagram is a good way of starting to build a computer model. The technique helps you to map out the structure of the system to be modeled. It shows the factors and relationships that are important, and helps you to start quantifying the linkages between factors.

How to use tool: **Relationships between factors:**
At the heart of the use of system diagrams is the idea of linking factors to show a relationship between them.

For example, a company may link the factors of product quality and customer satisfaction. It believes that as the quality of its goods change, so will customers' happiness. We show this as an arrow linking the two factors:

Figure 1: A Simple Same Way Relationship Between Two Factors

The **S** shows that the factors move in the **S**ame way: As quality improves, so will the happiness of customers. The arrow shows the direction of the relationship: Raising customer happiness does not necessarily raise the quality of the goods!

These relationships can also work the other way. The company may link price with the customers' perceptions of the "good value" of its goods. This is shown below:

Figure 2: An Opposite Relationship Between Two Factors

The **O** shows that the relationship works in the opposite way. In this case, as you raise price, customers' perceptions of good value reduce.

Feedback Loops:
Feedback is an important concept in the use of system diagrams: In very many cases changing one factor will impact on another factor, which will then affect the first.

Feedback will either reduce the impact of the change, or will amplify it.

Balancing Loops:
Where feedback reduces the impact of a change, we call this a **Balancing Loop**. The example below shows an example of a balancing loop, where an under-resourced service company is trying to raise quality:

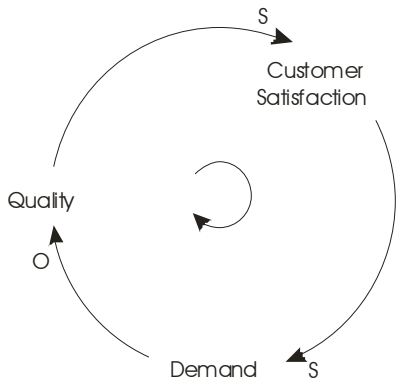


Figure 3: An Example Balancing Loop

In this situation, improving the quality of service leads to improved customer satisfaction, which leads to an increase in demand for the company's service. In trying to meet this demand, the company has less time to devote to individual customers, which reduces its ability to improve quality further.

Note the small circular arrow in the middle of the loop. This shows which way round the loop is running. In complex diagrams with many loops, this arrow will be labeled and will identify loops.

The graph below shows how quality of service might vary with time in the example above:

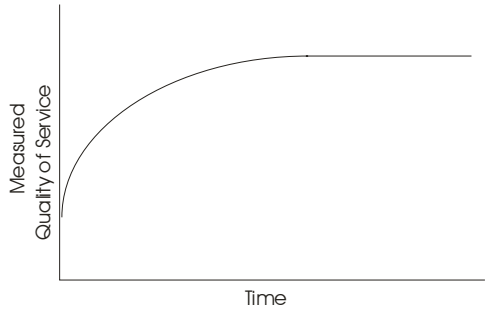


Figure 4: Graph Showing How Quality Changes Over Time in the Balancing Loop in Figure 3.

Reinforcing loops:
Where feedback increases the impact of a change, we call this a **Reinforcing Loop**. The example below shows an example of a theatre trying to improve its profitability by investing more in productions.

As more investment is put into a production, the theatre is able to put on more lavish plays with more famous actors. Better plays should bring better reviews, and therefore higher ticket sales. This should lead to higher profitability, and therefore more money available to invest in future productions.

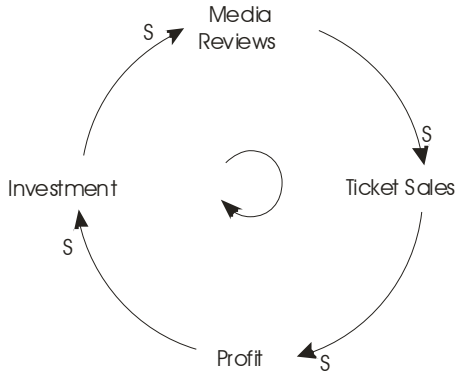


Figure 5: Reinforcing Loop Showing the Effect of Increasing Investment in a Theatre

A graph showing how ticket sales might vary against time is shown below:

Figure 6: Graph Showing the Effect on Sales of the Reinforcing Loop in Figure 5

Note that this assumes that investment is increasing as time goes on. It also ignores some important facts: First, there are only a certain number of seats in the theatre, and second, the external factors such as competition and market saturation will eventually limit growth. On a system diagram showing the way that the theatre operates, these factors would be shown as balancing loops impacting on this reinforcing loop.

External Factors:
The system diagrams we have looked at so far completely ignore the impact of these external factors on them.

In our balancing loop example above, we assumed that demand was raised only as customers became more satisfied. In reality, demand is just as likely to be affected by the state of the economy. This is shown in a modified diagram below:

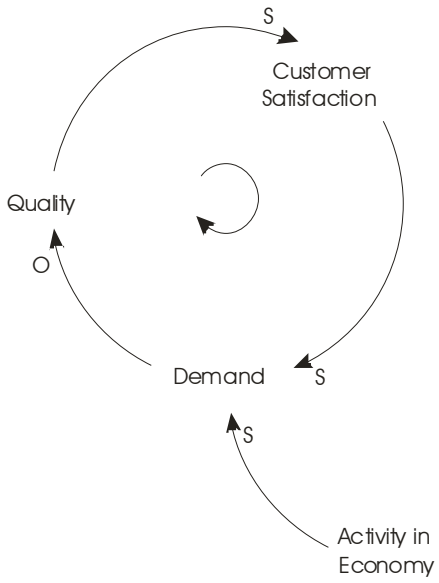


Figure 7: Diagram Showing the Effect of an External Factor on a System

We show an external factor as a labeled relationship arrow pointing to the appropriate part of the system diagram.

Gaps:
In our reinforcing loop example above, we related sales of theatre seats to investment in productions. What we were not able to build into the model was the fact that there are only a limited number of seats in the theatre.

Inevitably, this will cap the growth of ticket sales as the theatre will seriously upset customers if it sells more tickets than it has seats available!

We build this into our model with the idea of a **gap**. There is a gap between the number of seats available (an external factor we have not yet built into our model), and the number of seats used (tickets sold).

As the theatre sells more tickets, the size of this gap reduces. At a particular point, it cannot sell any more tickets. Increases in investment beyond this point may not yield any more profit.

We show this by modifying our diagram to show both the external factor of the limit of the number of seats, and to show the gap:

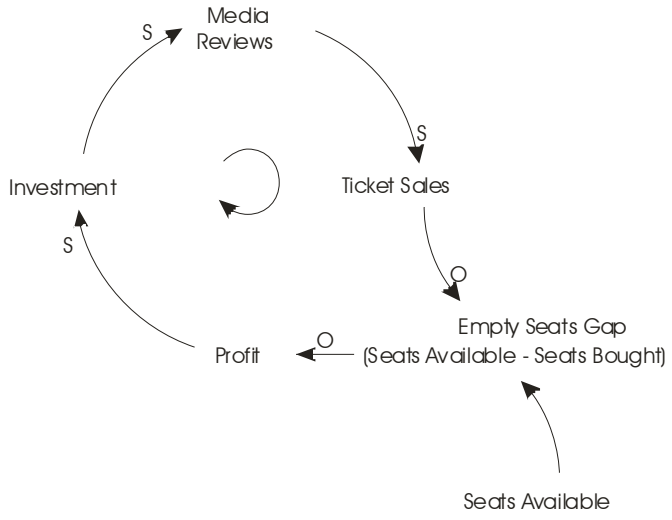


Figure 8: Systems Diagram Showing the Effect of a Gap on a System

When all seats are sold, i.e. *when seats available - seats bought* = 0, then profit will not rise any higher unless other factors are brought into the system.

Note that it is very important to get the gap definition correct for your model.

Delay:
The impact of delay is the final area we need to consider in our system diagrams.

Ideally, when we make a change to a system it should adjust immediately to its new state. In reality, there is almost always a delay before other factors adjust. This delay may occur in a mechanical system simply as a result of inertia and friction. In a human system it will occur as people take time to communicate, get use to new ideas, and implement change.

We can show this delay in a simple model using antelopes and cheetahs. As the number of antelopes rises, more food is available for the cheetahs. More cheetahs will therefore survive, and will be able to breed.

One part of the delay within this system is given by the length of time it takes for a cheetah to be born and grow to maturity. The other part occurs as starving cheetahs take time to die.

Feedback occurs as cheetahs kill antelopes. The higher the number of cheetahs, the greater will be their impact on the antelope population.

The system below shows this:

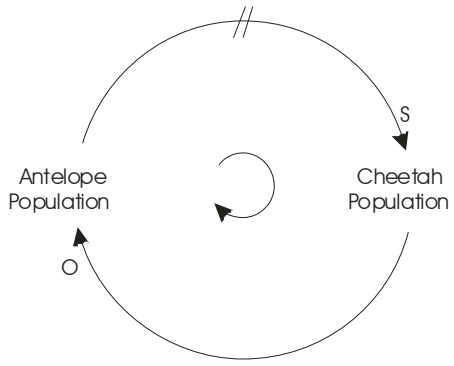


Figure 9: Diagram Showing Delay in a System

Note the double slash on the line showing the relationship between the antelope and cheetah populations. This shows that some form of delay is slowing the change of the related factor.

If there was no delay within the system, we might expect to see a graph showing the number of cheetahs over time like the one below:

Figure 10: Graph Showing the Adjustment in Cheetah Population in the Example in Figure 9 if there was no Delay

Here adjustment would be immediate. Any change in the antelope population would be instantly matched by an increase in the cheetah population. These additional cheetahs would eat the additional antelopes, and then die immediately.

The delay in the system causes it to behave in a different way:

- First, the cheetah population will take time to increase.
- Next, the large population of cheetahs will continue to breed as food starts to become scarce.
- This number of cheetahs will cause a big reduction in the number of antelopes.

- This will then lead to a crash in cheetah population as animals starve.
- The antelope population will then recover, as there will be fewer cheetahs to restrict their numbers.

If nothing else has any impact on this system, then cheetah numbers may oscillate as shown below:

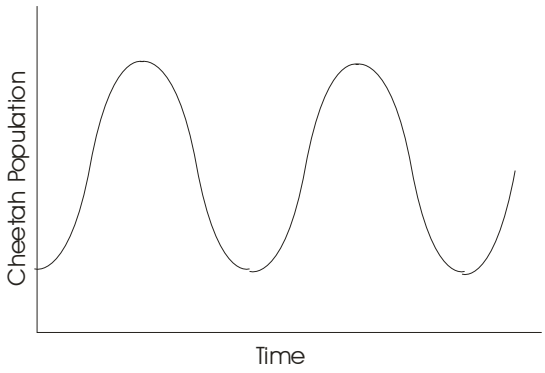


Figure 11: Graph Showing the Effect on Cheetah Populations when Delay is Considered in Figure 9.

This occurs as the cheetah population continually over-adjusts, first in growth, and second in decline. In this system, the longer it takes for a cheetah to starve - i.e. the greater the delay - the greater will be the variations in cheetah populations.

Improving the Systems Model:
The models we have looked at so far have been simple. They have ignored many possible impacts on each system. For example, in our model of antelopes and cheetahs, we have ignored the impact of disease, drought, human activity, etc.

We improve the model by building in as many of these external factors as we can think of. We can then simplify it by eliminating those factors that have a negligible impact.

External factors might be:
- Natural - weather, natural resources, disease, environmental change, etc.
- Technological - new technologies, changes in technology, etc.
- Human - psychological, emotional, ambitions, expectations, etc.
- Political - ideology, corruption, effectiveness, interest, etc.
- Social - values, social inertia, traditions, philosophies, etc.
- Financial - state of the economy, capital available, etc.
- Etc.

Ultimately, you may end up with a model made up of a number of reinforcing loops, balancing loops and external factors. The example below shows a more sophisticated diagram of the antelopes and cheetahs system:

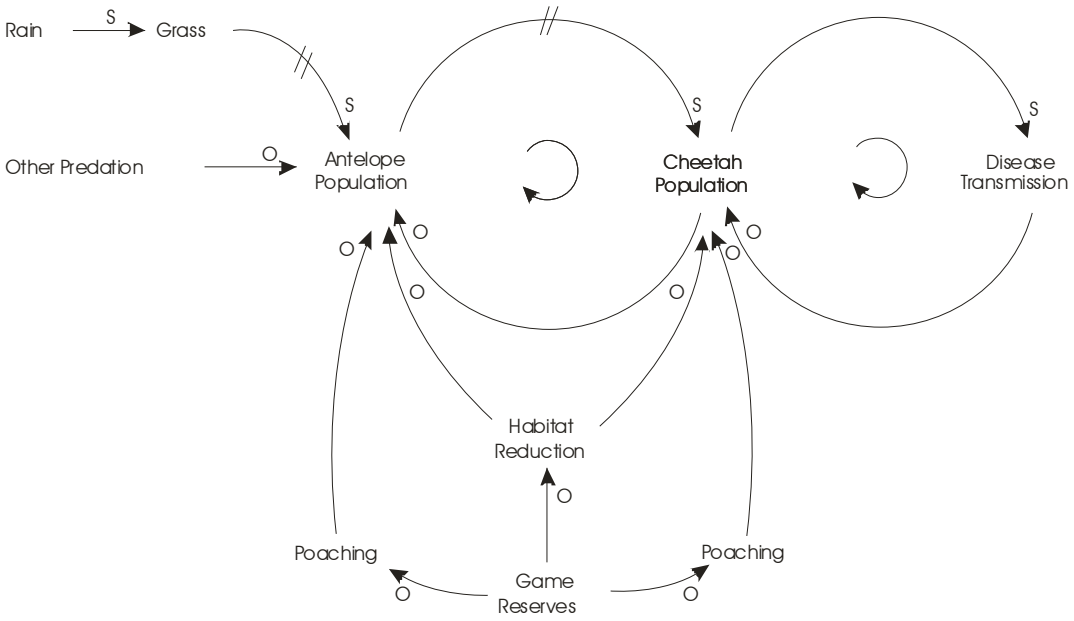


Figure 12: The Completed Systems Model Showing the Way in Which Antelope And Cheetah Populations Vary

Systems Diagrams as the basis of computer models:
Once you have established the relationships between factors on your diagram, you can look to see if you can put numbers to the relationships. In the example above, you may find that if drought halves the amount of grass available to antelopes, than the antelope population reduces by one third.

You can build this relationship into a computer model. A useful way of starting this with simple and moderately complex model is to build the model on a spreadsheet.

You can use this model to make predictions by changing factors within it. This would allow you to assess the likely impact on your system of external changes, and investigate the effect of changes you might make within the system.

Key points:

Systems diagrams allow you to model the way in which complex systems work. They help you to think through the way in which the factors within a system interact and feed back upon themselves.

You should now be able to analyse:

- How factors are related, and how one factor will change when another changes
- How factors may feed back in either balancing loops or reinforcing loops
- How external factors impact on the system
- How gaps operate

- How delay affects the system
- All the complexities of a system

SWOT Analysis (2.5)

Function: Analyzing Your Strengths, Weaknesses, Opportunities and Threats

---

Why use the tool? SWOT Analysis is a very effective way of identifying your Strengths and Weaknesses, and of examining the Opportunities and Threats you face. Carrying out an analysis using the SWOT framework will help you to focus your activities into areas where you are strong, and where the greatest opportunities lie.

How to use tool: To carry out a SWOT Analysis write down answers to the following questions:

Strengths:
- What are your advantages?
- What do you do well?
- What do other people see as your strengths?

Consider this from your own point of view and from the point of view of the people you deal with. Don't be modest. Be realistic. If you are having any difficulty with this, try writing down a list of your characteristics. Some of these will hopefully be strengths!

Weaknesses:
- What could you improve?
- What do you do badly?
- What should you avoid?

Again, consider this from an internal and external basis: Do other people seem to perceive weaknesses that you do not see? Are your competitors doing any better than you? It is best to be realistic now, and face any unpleasant truths as soon as possible.

Opportunities:
- Where are the good opportunities facing you?
- What are the interesting trends you are aware of?

Useful opportunities can come from such things as:
- Changes in technology and markets on both a broad and narrow scale
- Changes in government policy related to your field
- Changes in social patterns, population profiles, lifestyle changes, etc.
- Local Events

Threats
- What obstacles do you face?
- What is your competition doing?
- Are the required specifications for your job, products or services changing?
- Is changing technology threatening your position?
- Do you have bad debt or cash-flow problems?

Carrying out this analysis will often be illuminating, both in terms of pointing out what needs to be done, and in putting problems into perspective.

You can also apply SWOT analysis to your competitors, as this may produce some interesting insights!

Example:

A start-up small consultancy business might carry out the following SWOT analysis:

Strengths:

- We are able to respond very quickly as we have no red tape, no need for higher management approval, etc.
- We are able to give really good customer care, as the current small amount of work means we have plenty of time to devote to customers.
- Michael Johnson has strong reputation within the market.
- We can change direction quickly if we find that our marketing is not working.
- We have little overhead, so can offer good value to customers.

Weaknesses:

- Our company has no market presence or reputation.
- We have a small staff with a shallow skills base in many areas.
- We are vulnerable to vital staff being sick, leaving, etc.
- Our cash flow will be unreliable in the early stages.

Opportunities:

- Our business sector is expanding, with many future opportunities for success.
- Our local council wants to encourage local businesses with work where possible.
- Our competitors may be slow to adopt new technologies.

Threats:

- Will developments in *XYZ* technology change this market beyond our ability to adapt?
- A small change in focus of a large competitor might wipe out any market position we achieve.

The consultancy might therefore decide to specialize in rapid response, good value services to local businesses. Marketing would be in selected local publications, to get the greatest possible market presence for a set advertising budget. The consultancy should keep up-to-date with changes in technology where possible.

Key points:

SWOT analysis is a framework for analyzing your strengths and weaknesses, and the opportunities and threats you face.

This will help you to focus on your strengths, minimize weaknesses, and take the greatest possible advantage of opportunities available.

Cash Flow Forecasting with Spreadsheets (2.6)

Function: Predicting whether a financial decision will be viable, and investigating the impact of changing factors

Why use the tool? Cash Flow forecasts help you to build a model of the way in which cash moves within a project or organization. They help you to predict whether the sales or income you forecast will cover the costs of operation. They also allow you to analyze whether a project will be sufficiently profitable to justify the effort put into it.

Cash Flow forecasts can also be useful for analyzing your own personal finances. This is useful when you are about to make difficult financial decisions.

By carrying out a Cash Flow forecast on a spreadsheet package, you can investigate the impact of changing factors within the forecast. If you have structured the spreadsheet correctly then you will be able to see, more or less instantly, the effect that changes will have.

Normally, we structure Cash Flow Forecasts in a standard way. This is explained below. Other sorts of forecasting can be carried out with spreadsheets. A good way of structuring these is to analyze the system being forecasted with a system diagram (see 2.4). This system diagram will show the relationships between factors. You can then quantify these relationships, and build a model based on them. The structure of the model will depend on the system being modeled.

How to use tool: We structure the Cash Flow Forecast as a table. On the table we have columns for each period (normally a month) within the forecast. Rows show individual cash movements such as sales of a product, sales costs, and particular expenses.

We create the table for the forecast in three stages. Refer to the example in figure 2.6 as we run through the stages:

1. Set Up Column Headings:
Decide the period of time over which you want to run your forecast, and the length of the periods within it. Typically, the forecast will run over 1-2 years, with the periods as months.

Head up one column with the title “Cash Movement”. Then enter the periods of the forecast as the next column headings. This will give you column headings of, for example, *Cash Movement, January, February, March, April….* etc.

2. Set Up Row Titles:
We organize rows into three main groups:

- Income:
  These rows show income expected during the period. Set up a separate row for each source of income. Examples might be:
  Sales of ABC product
  Sales of BCD service

Investment income
Etc.

Where costs of operation are directly dependent on the amount sold, you may decide to deduct the direct cost of the sales made within this group of rows. Put in a subtotal at the bottom of the group.

- Outgoings:
  These rows show all of your costs, itemized by the type of cost. Examples might be:
  Staff salaries
  Payroll taxes
  Stationery
  Telephones
  Etc.
  Set up a subtotal at the bottom of this group.

- Totals:
  The next row shows the total of the income rows minus the total of the out-going rows for the month. This shows you your profit or loss for the month.

  Underneath this, put in a running total. In this row add your profit or loss for the period to the previous running total. This shows your financial position at the end of the period.

3. Estimate values:
By now you should have a table marked out with column headings and row titles. Now fill in the values of the cells on your table. An easy way of doing this is to fill in the first column, and then use the spreadsheet "fill right" function to copy values across. Then adjust values in the other columns appropriately.

When you are entering projections for sales for a new business, bear in mind you will not sell much until your customers have seen mention of your business several times (often 6 or 7 times). Your estimates for sales will be much more reliable if you base them either on previous years' revenues, on trial marketing, or on good quality market research.

When you are entering values for costs, try, where possible, to base projections on costs from previous years. If this is not possible, base your estimates on real prices quoted. This keeps your estimates as realistic as possible.

4. Calculate!
On most modern spreadsheet packages, this will happen automatically, providing you have set up totals correctly as described in section 2. As you enter and change the values of cells within the spreadsheet, you should see that the period totals and running totals change appropriately.

Example: A yachting enthusiast has decided that he wants to set up a yacht hire company. He has researched the costs of set up, and estimated the number of weeks of hire he can sell during the year.

Note that he has been quite optimistic in hoping to sell all the weeks of holiday available during the high season of July and August. He will charge the same price as his competitors for a holiday.

He works out the cash flow forecast below:

Figure 2.6.1: Cash Flow Forecast for ABC Yacht Charter Corporation (All values in US$)

Price of 6 berth boat for 1 week		850.00		Number of boats on hire:			2				
Cash Movement	**January**	**February**	**March**	**April**	**May**	**June**	**July**	**August**	**September**	**October**	**November**	**December**
Income:												
Boat Hire	0.00	0.00	850.00	1700.00	4250.00	5950.00	7650.00	7650.00	5100.00	2550.00	1700.00	850.00
Travel Insurance	0.00	0.00	85.00	170.00	425.00	595.00	765.00	765.00	510.00	255.00	170.00	85.00
Cancellation Insurance	0.00	0.00	25.50	51.00	127.50	178.50	229.50	229.50	153.00	76.50	51.00	25.50
Support Services	0.00	0.00	127.50	255.00	637.50	892.50	1147.50	1147.50	765.00	382.50	255.00	127.50
Total Income	**0.00**	**0.00**	**1088.00**	**2176.00**	**5440.00**	**7616.00**	**9792.00**	**9792.00**	**6528.00**	**3264.00**	**2176.00**	**1088.00**
Outgoings:												
Salaries	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00
Payroll Taxes	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00	750.00
Office Expenses	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00	120.00
Office Rental	230.00	230.00	230.00	230.00	230.00	230.00	230.00	230.00	230.00	230.00	230.00	230.00
Boat Yard Rent	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00	800.00
Utilities	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Maintenance	100.00	100.00	132.69	165.38	263.46	328.85	394.23	394.23	296.15	198.08	165.38	132.69
Boat Purchase Loans	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00	1500.00
Laundry & Cleaning	0.00	0.00	6.54	13.08	32.69	45.77	58.85	58.85	39.23	19.62	13.08	6.54
Insurance	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
Brochures	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00	50.00
Advertising	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00	300.00
Total Expenses	**5550.00**	**5550.00**	**5589.23**	**5628.46**	**5746.15**	**5824.62**	**5903.08**	**5903.08**	**5785.38**	**5667.69**	**5628.46**	**5589.23**
Monthly Total:	-5550.00	-5550.00	-4501.23	-3452.46	-306.15	1791.38	3888.92	3888.92	742.62	-2403.69	-3452.46	-4501.23
Running Total:	**-5550.00**	**-11100.00**	**-15601.23**	**-19053.69**	**-19359.85**	**-17568.46**	**-13679.54**	**-9790.62**	**-9048.00**	**-11451.69**	**-14904.15**	**-19405.38**

Looking at these figures the enthusiast is very worried. Under the business scheme he wants to set up, he stands to lose about $20,000 each year. Either he will have to control costs in a major way, find a different business structure to operate under, or he must find another way of making a living.

He may have just saved a lot of money and stress by using a Cash Flow Forecast!

Key points:

Cash Flow Forecasts are important tools for investigating whether a project or business is viable. They allow you to experiment with changing factors, to see the impact that this will have. Spreadsheet packages are invaluable for cash flow forecasting.

We set up Cash Flow Forecasts in the following stages:

1. Setting out column headings for periods (normally months) during the forecast.
2. Setting out three main groups of rows:
    - Income rows, with a subtotal
    - Expenditure rows, with a subtotal
    - Period total and running total rows
3. Entering values within cells: Ideally you should do this from real data, or from formal market research information. If this is not possible, then you will have to use the best estimates you can make.
4. Calculation

Risk Analysis & Risk Management (2.7)

Function: How to evaluate and control the risks you face

Why use the tool? Risk Analysis is a formal framework that helps you to assess the risks that you or your organization face. A good risk analysis will help you to decide what actions to take to minimize disruptions to your plans. It will also help you to decide whether the strategies you could use to control risk are cost-effective.

How to use the tool: Here we define risk as "the perceived extent of possible loss". Different people will have different views of the impact of a particular risk: What may be a small risk for one person may destroy the livelihood of someone else.

One way of putting figures to risk is to calculate a value for it as:

risk = probability of event x cost of event

This allows you to compare risks objectively. We use this approach formally in decision making with Decision Trees.

To carry out a risk analysis, follow these steps:

1. Identify Threats:
The first stage of a risk analysis is to identify threats facing you. Threats may be:

- Human - from individuals or organizations, illness, death, etc.
- Procedural - from failures of accountability, internal systems and controls, organization, etc.
- Natural - threats from weather, natural disaster, accident, disease, etc.
- Technical - from advances in technology, technical failure, etc.
- Political - from changes in tax regimes, public opinion, government policy, foreign influence, etc.
- Project - risks of cost over-runs, jobs taking too long, of insufficient product or service quality, etc.
- Financial - from business failure, stock market, interest rates, unemployment, etc.
- Others

This analysis of threat is important because it is so easy to overlook important threats. Perhaps the best way to identifying all threats is to use a number of approaches:

- Firstly, run through a list such as the one above, to see if any apply.
- Secondly, think through the systems, organizations or structures you operate, and analyse risks to any part of those.
- See if you can see any vulnerability within these systems or structures.
- Ask other people, who might have different perspectives.

2. Estimate Risk:
Once you have identified the threats you face, the next step is to work out the likelihood of the threat being realized and to assess its impact.

One approach to this is to work out the probability of the event occurring, and to multiply this by the amount it will cost you to set things right after it has happened. This gives you a value for the risk.

Your estimates of the probability of the risk occurring and of the cost of the event will depend on your knowledge of your own systems, controls and resources.

3. Managing Risk:
Once you have worked out the value of risks you face, you can start to look at ways of minimizing them. When you are doing this, it is important to choose cost effective approaches. There is no point in spending more to eliminating a risk than the cost of the event if it occurs. In many cases it may be better to accept the risk than to use excessive resources to eliminate it.

Risk may be managed in a number of ways:

- **By using existing assets:** Here existing resources can be used to counter risk. This may involve improvements to existing methods and systems, changes in responsibilities, improvements to accountability and internal controls, etc.
- **By contingency planning:** You may decide to accept a risk, but choose to develop a plan to minimize its effects. A good contingency plan will allow you to take action immediately, with the minimum of project control.
- **By investing in new resources:** Your risk analysis should give you the basis for deciding whether to bring in additional resources to counter the risk.

4. Reviews:
Once you have carried out a risk analysis and management exercise, it may be worth carrying out regular reviews. These might involve formal reviews of the risk analysis, or may involve testing systems and plans appropriately.

Key points:

Risk analysis allows you to examine the risks that you or your organization face. It is based on a structured approach to thinking through threats, followed by an evaluation of the probability and cost of events occurring.

Risk analysis forms the basis for risk management. Here the emphasis is on cost effectiveness. Risk management involves adapting the use of existing resources, contingency planning and good use of new resources.

Moving On…

We have put a great deal of effort into developing and testing this e-book to make it as useful as possible. If you have any suggestions on how we can improve it for the future, then please let us know at editorial@mindtools.com or through the Mind Tools web site at www.mindtools.com. Alternatively, if you have enjoyed this e-book and found it useful, please let us know!

The Mind Tools web site at www.mindtools.com also offers articles on a wide range of important career development and personal effectiveness techniques, as well as a range of related products and services. Click here to visit Mind Tools.

Alternatively, visit http://www.mindtools.com/subscribe.htm to subscribe to the Mind Tools newsletter so that we can update you on new mind tools as we launch them.

Best wishes, and enjoy using Mind Tools!

Mind Tools
James Manktelow
ISBN: 0-9545586-1-8

Further Reading

1. Specific References

Where the creator of a specific mind tool can be identified, his or her name is shown here:

2.3. Cause & Effect Diagrams:
What Is Total Quality Control? the Japanese Way, Kaoru Ishikawa, Prentice Hall Trade, ISBN 0139524339